

Levels of Spontaneous Electrical and Acetylcholinesterase Activities During Aestivation of the Indian Apple Snail, *Pila globosa*

BY

P. MURALI MOHAN

AND

P. MURALI KRISHNA DASS

Department of Zoology, S. V. University College, Tirupati (A. P.), India

(1 Text figure)

INTRODUCTION

THE INDIAN APPLE SNAIL, *Pila globosa* (SWAINSON, 1822) aestivates under drought conditions by retiring into the deeper layers of the mud and sealing itself with the operculum (PRASHAD, 1925; SAXENA, 1956). The general metabolism of the animal decreases to a low level during aestivation (MEENAKSHI, 1956; RAGHUPATIRAMIREDDY, 1965). Under these conditions, it is likely that the nervous activity could also be low, since the necessity to respond to external environment does not arise. Moreover, the altered metabolism in aestivating snails may require a corresponding altered neuro-regulatory mechanism. Since the existence of such a mechanism is not known, an attempt was made to study these aspects, taking nervous activity as well as acetylcholinesterase activity as an index in aestivated animals.

MATERIALS AND METHODS

Active snails, *Pila globosa*, were made to aestivate for one month by embedding them in dry sand in wooden boxes (SAXENA, 1956).

The normal and aestivated *Pila* were dissected, exposing the different nerve cords under the binocular microscope. The spontaneous electrical activity was recorded by chlorided silver electrodes. The potentials were fed into the Tektronix 502A dual beam oscilloscope through Grass p9 preamplifiers. The photographic recordings were made using a Grass Kymograph camera.

For the estimation of acetylcholinesterase activity, the nervous tissue including all ganglia and cords, of normal and aestivated *Pila* was isolated and washed repeatedly with gastropod Ringer solution (HUGHES & KERKUT, 1956). The nervous tissue of each animal was used for a single analysis. The acetylcholinesterase (AChE) activity was estimated following the modified method of METCALF as suggested by MURALI KRISHNA DASS (1968). The incubation mixture contained 0.1 ml of 5% homogenate of the nervous tissue in 0.25M sucrose, and 1 ml of buffer-substrate mixture. After $\frac{1}{2}$ an hour of incubation, the unreacted acetylcholine was determined by measuring the optical density at 540 m μ using Ultraviolet Spectrophotometer (Hilger and Watts, England), employing glass cuvettes of 10 mm light path.

RESULTS AND DISCUSSION

The level of spontaneous electrical activity has shown a definite decrease in all the nerves of the aestivated *Pila* from that of the normal as is evident from the recordings (Figure 1). Both the amplitude and frequency of the responses were affected on aestivation. A lower level of spontaneous activity parallels the lowered level of the active state of the animal (K. P. RAO, 1964; VENKATACHARI, 1968). Hence during aestivation, while the animal remains in a state of torpor, a decreased level of spontaneous activity is expected. Similar decrease in electrical activity was observed in the brain and ganglia of pupae of diapausing insects (TYSHTCHENKO & MANDELSTAM, 1965; KUTYNA & TOMBES, 1966).

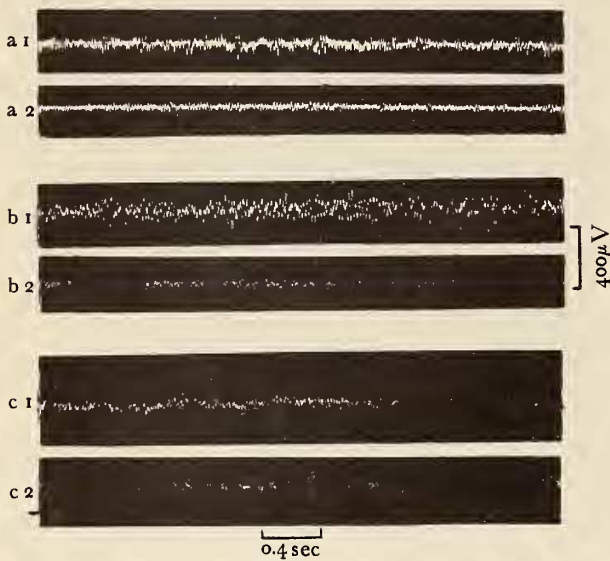


Figure 1

Spontaneous activity recorded from cerebral commissure (a 1, a 2), supra-intestinal nerve (b 1, b 2) and left pleuro-visceral connective (c 1, c 2) in normal (a 1, b 1, c 1) and aestivated (a 2, b 2, c 2) *Pila globosa*

Note the decrease in the spike amplitude and frequency of pulses on aestivation

A direct relationship between electrical activity and AChE activity was demonstrated in relation to the behavior of scorpion (VENKATACHARI & MURALI KRISHNA DASS, 1968). Since in the present case a considerable decrease in the spontaneous activity was observed, it is possible that the associated AChE activity might also have a corresponding decrease in activity. As is evident from Table 1, there is a decrease in the AChE activity level

Table 1

Levels of acetylcholinesterase enzyme activity in normal and aestivating *Pila globosa*. (Activity is expressed in mg of acetylcholine metabolised per gm weight of tissue per hour).

Normal snails	Aestivating snails	% decrease during aestivation
338 ± 20.09	281.33 ± 17.78	16.76
(P > 0.001)		
Each value in this table is an average of six separate analyses (six animals).		

in nervous tissue of aestivated snails. This observation may possibly reiterate the direct relationship between electrical activity and AChE activity.

Since the nervous system in general is known to regulate the activities of the animal, the lowered nervous activity of aestivating snails in terms of decreased spontaneous and acetylcholinesterase activities could be responsible for their observed lowered metabolism. Further work along these lines is in progress.

SUMMARY

1. The spontaneous electrical and acetylcholinesterase activities were studied in the nervous tissue of normal and aestivated *Pila globosa*.
2. The spontaneous activity decreased in aestivated snails. Correspondingly, there was a decrease in the AChE activity.

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